



Department of
Biomedical Engineering

UNIVERSITY OF WISCONSIN-MADISON

Celebrating 25 Years

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Seminar Series

Nature-Inspired Metasurfaces for Next-Generation Imaging and Diagnostics

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Assistant Professor

Mechanical and Aerospace Engineering

University of California, San Diego

Co-sponsored by Morgridge Institute for Research and
the Center for Quantitative Cell Imaging

The origin and progression of a variety of leading health challenges, encompassing Alzheimer's disease, heart disease, fibrosis and cancer, are directly linked to changes in the presence and orientation of fibrous matter in biological tissue. Fibrous biological tissue exhibits distinct anisotropic optical properties, which can be leveraged for selective imaging.

However, these naturally occurring light-matter interactions are inherently weak, posing barriers to their visualization in a clinically translatable manner. Here, we leverage the strengths of nanoscale optics to scale down and enhance light-matter interactions. We draw inspiration from structural color in nature to develop anisotropic, colorimetric metasurfaces, which exhibit a polarization-sensitive optical response. We demonstrate the potential of these nature-inspired metasurfaces to selectively visualize disease-relevant fiber density and orientation in biological tissue. Starting with the example of breast cancer diagnostics, we then expand our view to the rich palette of fiber-affecting diseases where metasurfaces hold great potential to achieve rapid, precise and low-cost tissue diagnostics with facile clinical implementation.

ABOUT the SPEAKER

Lisa Poulikakos is an Assistant Professor of Mechanical and Aerospace Engineering at UCSD. She received her PhD at ETH Zürich, where she introduced an original theoretical and experimental technique to enable the rational design of chiral nanophotonic systems. Her postdoctoral research at Stanford University focused on developing functional nanophotonic surfaces for all-optical and label-free cancer tissue diagnostics. Her lab at UCSD develops chiral and anisotropic nanophotonic materials e.g. for next-generation imaging. She is a recipient of the ETH Medal, awarded to outstanding doctoral theses, the L'Oréal USA For Women in Science Postdoctoral Fellowship, the Swiss National Science Foundation Early Postdoc Mobility Fellowship, the RCSA Scialog Fellowship for Advancing Bioimaging, the UCSD MRSEC New Investigator Award, the Beckman Young Investigator Award, the AFOSR Young Investigator Program Award and the Packard Fellowship for Science and Engineering.



Monday, October 21 at Noon
1003 Engineering Centers (Tong Auditorium)

